

Claims

1. A pyrophosphoric acid bath for use in cyanogen-free copper-tin alloy plating, characterized by containing an additive (A) composed of an amine derivative, an epihalohydrin
5 and a glycidyl ether compound.

2. A pyrophosphoric acid bath for use in cyanogen-free copper-tin alloy plating according to claim 1, wherein the
10 amine derivative comprises one member, or two or more members selected from the group consisting of ammonia, ethylenediamine, diethylenetriamine, piperazine, n-propylamine, 1,2-propanediamine, 1,3-propanediamine, 1-(2-aminoethyl)piperazine, 3-diethylaminopropylamine,
15 dimethylamine, hexamethylenetetramine, tetraethylenepentamine, triethanolamine, hexamethylenediamine and isopropanolamine.

3. A pyrophosphoric acid bath for use in cyanogen-free
20 copper-tin alloy plating according to claim 1, wherein the amine derivative is piperazine or 1-(2-aminoethyl)piperazine.

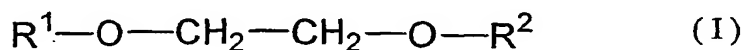
4. A pyrophosphoric acid bath for use in cyanogen-free
25 copper-tin alloy plating according to claim 1, wherein ratios of the epihalohydrin and of the glycidyl ether compound in

the additive (A) are 0.5 mol to 2 mol of the epihalohydrin and 0.1 mol to 5 mol of the glycidyl ether compound, respectively, per 1 mol of the amine derivative.

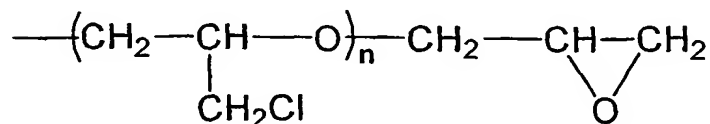
- 5 5. A pyrophosphoric acid bath for use in cyanogen-free copper-tin alloy plating according to claim 1 or 4, wherein the glycidyl ether compound in the additive (A) is a polyfunctional glycidyl ether compound having two or more functional groups in the molecule.

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6. A pyrophosphoric acid bath for use in cyanogen-free copper-tin alloy plating according to claims 1 or 4, wherein the glycidyl ether compound in the additive (A) is a polyglycidyl ether of an adduct of ethylene glycol added with
15 0 to 2 mol epichlorohydrin, represented by general formula (I)



(wherein R^1 and R^2 , which may be the same or different, each represent a group represented by the following formula



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and n is 0 or 1).

7. A pyrophosphoric acid bath for use in cyanogen-free copper-tin alloy plating according to claim 1, further

comprising an additive (B) composed of an organic sulfonic acid and/or an organic sulfonic acid salt.

8 A pyrophosphoric acid bath for use in cyanogen-free
5 copper-tin alloy plating according to any one of claims 1 to
7, wherein the plating bath has a pH of 3 to 9.

9. A copper-tin alloy coating which can be obtained by using
the pyrophosphoric acid bath described in any one of claims
10 1 to 8 above.